

With the type specimen I have associated *Thompson*, no. 4547a from southwestern Oregon, not far north of the type locality. Although it appears to be an alpine ecotype of *I. Thompsonii*, certainty is impossible since the single flower is poorly preserved. In most respects it seems to be a miniature version of the typical form, with the spathes somewhat narrower in proportion to their length, but such differences as exist do not justify giving it separate status as a form, particularly on the basis of a single specimen.

GRAY HERBARIUM,
HARVARD UNIVERSITY.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXIII.

M. L. FERNALD

(Continued from page 182)

VI. STUDIES IN SOLIDAGO

SOLIDAGO PETIOLARIS Ait. The late K. K. Mackenzie substituted for *S. petiolaris* the name *S. Milleriana* Mackenz. in Small, Man. 1350, 1503 (1933), on the first cited page giving in marks of quotation as a synonym of his new name "*S. petiolaris* Ait.", on p. 1503 "*Solidago Milleriana* Mackenzie. *Solidago petiolaris* Authors, not Ait." The inference is clear that Mackenzie thought that *S. petiolaris* Ait. has been misidentified by American authors. Aiton's species had been received at Kew from Philip Miller; consequently, if the plant which has passed regularly as Aiton's *S. petiolaris* is not what Aiton had from Miller, it seems a somewhat tangled philosophy which produces for it the name *S. Milleriana*. I do not know Mackenzie's reason for supposing that his *S. Milleriana* is not *S. petiolaris* Ait. The characterization of the latter was brief and clear:

S. caule erecto villosa, foliis ellipticis scabriusculis petiolatis, racemis erectis elongatis.

Mackenzie's *S. Milleriana* has

Stem . . . strict, closely short-hispid above, . . . : leaf-blades oblong-oval, . . . scabrous-hispidulous above, sparsely pubescent beneath . . . : heads 7–8 mm. high: involucral bracts lanceolate, acute, appressed-pubescent, all except the inner with spreading tips.

Aiton did not describe the involucre; but portions of Aiton's type, presented to Asa Gray in 1881 and now preserved in the Gray Herbarium, show the very distinctive heads with lance-attenuate, pubescent bracts, and the oblong or elliptic, entire leaves with scabrous upper surface, minutely pilose lower surface and scabrous-ciliolate margins exactly as in *S. Milleriana*. In brief, *S. petiolaris* Ait., as shown by the original material, was well described by its author and is exactly the plant correctly called *S. petiolaris* by Gray in the Synoptical Flora. It is identical with *S. Milleriana* Mackenzie and the latter name is a synonym which might well have been avoided.

SOLIDAGO MULTIRADIATA Ait., var. **parviceps**, var. nov. (TAB. 417, FIG. 2), forma typica recedit involucro parvo 3-4(-5) mm. longo bracteis circa 15.—QUEBEC: damp calareous cliff, "Monts Appalaches, near Cape Rosier, Gaspé Co., July 9, 1931, G. L. Stebbins, jr. (TYPE in Gray Herb.)

Typical *Solidago multiradiata* (FIG. 1) which abounds on the Labrador Peninsula, in northeastern, northern and western Newfoundland and on the outer coast and the higher mountains of the Gaspé Peninsula, reaching its southern limit on St. Paul Island, Nova Scotia (*Perry & Roscoe*, no. 382), varies in stature from dwarfs of scarcely measurable height to luxuriant clumps 4.5 dm. high; but, whether dwarf or gigantic (for the species) the involucre remains large (5-7 mm. long) with 20-30 bracts. Var. *parviceps*, a local plant of Gaspé, reaches its most extreme development (FIG. 2) on the cliffs of the "Monts Appalaches" (the hills between Grand Grève and Cape Rosier) but essentially identical specimens, mixed with more typical *S. multiradiata*, were collected on Mt. Albert by Victorin, Rolland, Brunel & Rousseau in 1923 (no. 17,585) and transitional material had been secured on Mt. Albert in 1881 by John A. Allen, and in 1906 by Fernald & Collins (no. 753). This transitional series indicates that var. *parviceps* is a variety rather than a distinct species.

SOLIDAGO DECUMBENS Greene, var. **oreophila** (Rydb.), comb. nov. *S. oreophila* Rydb. Mem. N. Y. Bot. Gard. 1. 387 (1900).

Solidago oreophila was not described by Rydberg, when he published it, but it is here interpreted as the common extreme of *S. decumbens* growing in the Rocky Mountains lower down than the typical *S. decumbens*. The latter has few heads in a subcorymbiform thyrse and is the alpine extreme of the wide-ranging species, found from 9,000-13,100 feet (2750-4000 m.), on the mountains from Wyoming to New Mexico. At lower levels it passes insensibly into the taller



Photo. E. C. Ogden

SOLIDAGO DEAMII: FIG. 1, TYPE, $\times 5/12$; FIG. 2, head from TYPE, $\times 5$; FIG. 3, disk-floret from TYPE, $\times 5$.

S. RANDII: FIG. 4, head, $\times 5$, from Maine; FIGS. 5 and 6, florets, $\times 5$, from same specimen.

S. RACEMOSA, var. *GILLMANI*: FIG. 7, rosette-leaf from the original Gillman material, $\times 5/12$.



Photo. E. C. Ogden

SOLIDAGO SIMULANS: FIG. 1, TYPE, $\times \frac{2}{5}$; FIG. 2, involucre of TYPE, $\times 5$; FIG. 3, disk-flower from TYPE, $\times 5$; FIG. 4, disk-corolla, with 2 lobes laid back, $\times 5$; FIG. 5, achene from TYPE, $\times 10$.

S. ULIGINOSA: FIG. 6, involucre, $\times 5$, from Quebec; FIG. 7, disk-corolla, $\times 5$, from same specimen; FIG. 8, achene, $\times 10$, from same specimen.

S. AUSTRINA: FIG. 9, involucre, $\times 5$, from North Carolina.

var. *oreophila* which has a longer, more racemiform thyrses, with the heads tending to be slightly smaller. In the States from New Mexico to Wyoming (the area where the alpine typical *S. decumbens* occurs) var. *oreophila* extends from subalpine areas into the timber ("in timber," "pine woods," "dry pine ridge," "subalpine slopes," "dry hillsides," etc.), its altitudinal range given on the labels as 6560–10,000 feet (2000–3050 m.). Many sheets, such as *Clokey* nos. 2895 and 3896 and *Clements* no. 300, show embarrassingly transitional series and such a sheet as *C. F. Baker's* no. 718, with the elongate thyrses and small heads of var. *oreophila* was identified by Greene as his *S. decumbens*; and the names have been very frequently reversed by those who should rightly apply them if the series can be resolved into two real species. North of Wyoming var. *oreophila* comes down to much lower levels, extending out to the Saskatchewan plains and northward to the valleys of Yukon. My interpretation of *S. oreophila* is supported by the statement of Dr. Aven Nelson, under *S. decumbens*: "*S. oreophila* Rydb. . . . is merely the larger form from the lower stations."¹

Greene included both extremes in his original *S. decumbens*, *Pittonia*, iii. 161 (1897), giving an inclusive description of the "Very common species of the Rocky Mountains of Colorado and northward, in subalpine and alpine situations, but occupying dry slopes or summits; forming the greater part of Gray's *S. humilis*, var. *nana*." I am, accordingly, taking up *S. decumbens* in the sense of the alpine extreme which Gray chiefly had as his *S. humilis*, var. *nana*, this interpretation conforming to the later views of Rydberg and others.

As stated, Rydberg originally gave no diagnosis, but he gave sufficient clues so that it is evident that his *Solidago oreophila* was intended for the plant of the Rocky Mountain area with slender and elongate thyrses. His publication was as follows:

Solidago oreophila; *Solidago stricta* Hook. Fl. Bor. Am. 2: 4, mainly, 1834; not Ait., 1789; *S. humilis* Gray, Syn. Fl. 1²: 148, partly, as to the Rocky Mountain plant [Man. R. M. 153]; not Pursh.

At an altitude of about 2000 m.

MONTANA: Gap in the belt Mountains above White's Gulch, 1882, Canby.

With no diagnosis *Solidago oreophila* must go back for its typification to the earlier defined entities. The Rocky Mountain element placed by Gray under *S. humilis* is clear, so also is the Carlton House plant of

¹ Nelson in Coult. & Nels. New Man. Bot. Centr. Rky. Mts. 505 (1909).

Drummond, cited by Hooker under his inclusive *S. stricta*, for material of the latter sent by Hooker to Asa Gray was included by Gray under his *S. humilis*. Thus it is possible, with the aid of his subsequent descriptions, to interpret what Rydberg meant by *S. oreophila*; but such slipshod publication of new species is not to be recommended to others.

SOLIDAGO ROANENSIS Porter, var. **monticola** (T. & G.), comb. nov. *S. Curtisii* T. & G., β .? *monticola* T. & G. Fl. N. Am. ii. 200 (1838). *S. monticola* T. & G. ex Chapm. Fl. 209 (1860), not Jord. (1857). *S. alleghaniensis* House in Am. Midl. Nat. vii. 131 (1921).

Typical *Solidago roanensis* Porter, Bull. Torr. Bot. Cl. xix. 130 (1892), has the thyrses very dense, except sometimes at base; the involucre greenish and herbaceous to membranous and 5–5.5 mm. long; and the ligules deep-yellow. It is confined to the highest mountains of western North Carolina and adjacent Georgia, extending slightly northward into southwestern Virginia. When he described it as a species Porter was familiar with *S. monticola*, to which it has generally been reduced, yet he made no mention of nor comparison with the latter plant; and Asa Gray wrote upon a sheet of the large *S. roanensis* distributed as *S. monticola* from Roan Mountain (*J. D. Smith*): "Yes. I could not have thought it." Nevertheless there seems to be no clear line to separate it and the smaller *S. monticola* and even in Mackenzie's treatment in Small's Manual the two are united. Var. *monticola*, with a broader range, often at lower altitudes, from Maryland to Kentucky, southward to Georgia and Alabama, is smaller throughout, the slender thyrses or the slender racemiform branches (when a panicle is developed) more open; the involucres 4–5 mm. long, usually paler; and the ligules paler yellow or even whitish.

SOLIDAGO (§*VIRGAUREA*) **Deamii**, n. sp. (TAB. 418, FIGS. 1–3), *S. Randii* similis; caule 4–5 dm. alto supra minute piloso; foliis coriaceis pallidis glabris, basilaribus rosulatis obovatis apice rotundatis grosse serrato-dentatis basi late petiolatis, laminis 3.5–5.5 cm. longis 2–3.5 cm. latis; foliis caulinis 35–40, imis subpetiolatis oblanceolatis serratis, mediis superioribusque sessilibus minoribus integris acutis; inflorescentia thyrsoides densa 1 dm. longa 4 cm. diametro; pedicellis nullis aut 1–8 mm. longis strigoso-pilosis; involucris cylindrico-campanulatis 6–9 mm. longis; bracteis stramineis chartaceis obtusis, 4-seriatis, exterioribus viridicostatis, costa dilatata, interioribus elongatis; disci floribus circa 12, lobis corallae 2 mm. longis; ligulis 8 luteis; antheris 2.7–3 mm. longis; achaeniis immaturis strigoso-pilosis.

—INDIANA: in a blow out at end of Section Line Road 2 miles east of Tremont, Porter Co., September 14, 1923, *C. C. Deam*, no. 39,707 (TYPE in Gray Herb.).

Solidago Deamii (FIG. 1) has the strongly coriaceous foliage of *S. speciosa* Nutt., but its strongly toothed and short-petioled radical leaves and its pubescent achenes promptly distinguish it from the smallest extremes of *S. speciosa*, which has long-petioled and entire or but slightly toothed radical leaves and glabrous achenes. In habit and in the crowded, sessile or short-pedicelled heads *S. Deamii* is suggestive of *S. Randii* (Porter) Britton, of northern New England, southern Quebec and northeastern New York; but *S. Randii* has submembranous dark-green foliage, the involucre (FIG. 4) smaller (5–6 mm. long), with thinner and narrower bracts, the orange-yellow disk-corollas (FIGS. 5 and 6) with shorter lobes and shorter (1.5–2 mm. long) anthers, the corolla-lobes and anthers (FIG. 3) of *S. Deamii* being much longer. *S. Deamii* is also related to *S. racemosa* Greene, var. *Gillmani* (Gray) Fern., but that has the leaves submembranaceous, the radical (FIG. 7) elongate-ob lanceolate and acute, the heads mostly long-pedicelled and the involucral bracts narrower.

SOLIDAGO simulans, sp. nov. (TAB. 419, FIGS. 1–5), planta *S. uliginosam* simulans; caule crasso glabro 8 dm. alto; foliis subcoriaceis glaberrimis eciliatis, basilaribus late oblanceolatis acutis 3–3.5 dm. longis 4.5–5 cm. latis crenato-dentatis basi attenuatis petiolo alato; foliis caulinis circa 20, imis elongatis petiolatis mediis superioribusque sessilibus minoribus lanceolatis integris acutis; inflorescentia cylindrico-thyrsoidea densa 2 dm. longo 3 cm. diametro ramis glabris brevis capitulis 3–10 gerentibus; pedicellis glabris 3–4 mm. longis; involucri cylindrico-campanulatis 6–7 mm. longis; bracteis stramineis chartaceis, 4-seriatis, exterioribus lanceolato-deltoides subacutis, interioribus oblongis vel oblongo-lanceolatis obtusis vel subacutis; disci floribus 9, tubo 2 mm. longo, fauce 2.5 mm. longo, lobis 2 mm. longis; ligulis 7, 1.5 mm. latis; achaeniis maturis lineari-cylindricis 8–10-costatis strigoso-hirtellis 3.3–3.5 mm. longis.—Macon County, NORTH CAROLINA: moist rocks on the high mountains of Macon County, near Highlands, September 15, 1897, *Biltmore Herb.*, no. 5730 (TYPE in Gray Herb.); Wild Cat Ridge, Highlands, October, 1902, *E. E. Magee*.

Solidago simulans so closely resembles *S. uliginosa* Nutt. that it has been mistaken for it. It differs at once in its glabrous inflorescence, larger involucre (FIG. 2), long throat and limb and short tube of the disk-corolla (FIGS. 3 and 4) and much longer definitely pubescent achenes (FIG. 5); the branches of the thyrse and the pedicels of *S. uliginosa* being hirtellous, the involucre (FIG. 6) only 4–5 mm.

long and with narrower bracts, the disk corollas (FIG. 7) with relatively longer tube and shorter throat and limb, the achenes (FIG. 8) only 1.5–2 mm. long and usually glabrous. *S. simulans*, as yet known only from the high mountains of Macon County, North Carolina, is to be watched for elsewhere along the Blue Ridge. It is the extreme southern and montane representative of *S. uliginosa*, which crosses eastern Canada from Labrador to Manitoba, and reaches its southeastern limit in West Virginia (Gormanian, alt. 2500 feet, *Svenson*, no. 4449).

Solidago simulans might, by current treatments, be traced to *S. austrina* Small. It differs from the latter in many characters: leaves with quite smooth margins (in *S. austrina* scabrous-ciliolate), the basal 3–3.5 dm. long and 4.5–5 cm. broad (in *S. austrina* 0.7–1.5 dm. long and only 1–2.5 cm. broad); cauline leaves about 20, attenuate-tipped, the median 1 dm. or more long (those of *S. austrina* 30–60, the middle and upper bluntish or with blunt callous tip, the median 3–5 cm. long); inflorescence dense, its racemes cylindric, not secund (in *S. austrina* lax and open with strongly secund racemes); involucre cylindric-campanulate, 6–7 mm. high, with chartaceous bracts, the outer lance-deltoid and acutish not conspicuously continued down the pedicels (in *S. austrina* the broader campanulate involucre (FIG. 9) shorter, with firm, green, oblong, obtuse bracts continuing indistinguishably down the pedicels); disk-corollas 6.5 mm. long (in *S. austrina* 3.7–4.5 mm.); mature achenes 3.3–3.5 mm. long (in *S. austrina* 2–3 mm.).

SHIFTING OF NAMES VERSUS ACCURATE IDENTIFICATIONS (PLATE 420). It is a commonplace to note that long-continued cultivation of plants, particularly if they be of naturally plastic groups and placed side-by-side with scores of their relations, renders them in some ways unlike the indigenous ancestors from which they were in part derived. This observation, though trite, is important in connection with the species of *Solidago* early proposed in Europe from plants which had long grown in the gardens. In his masterly and cautious life-long studies of the genus Asa Gray repeatedly commented on the impossibility of satisfactorily identifying with wild American plants most of the garden forms described by Willdenow, Miller and some other European authors. Occasionally the types of species described by Aiton from plants not too long grown and mixed with other species at Kew can be safely identified; but too many of Miller's types, from plants long grown in the old Chelsea Garden, are better allowed to

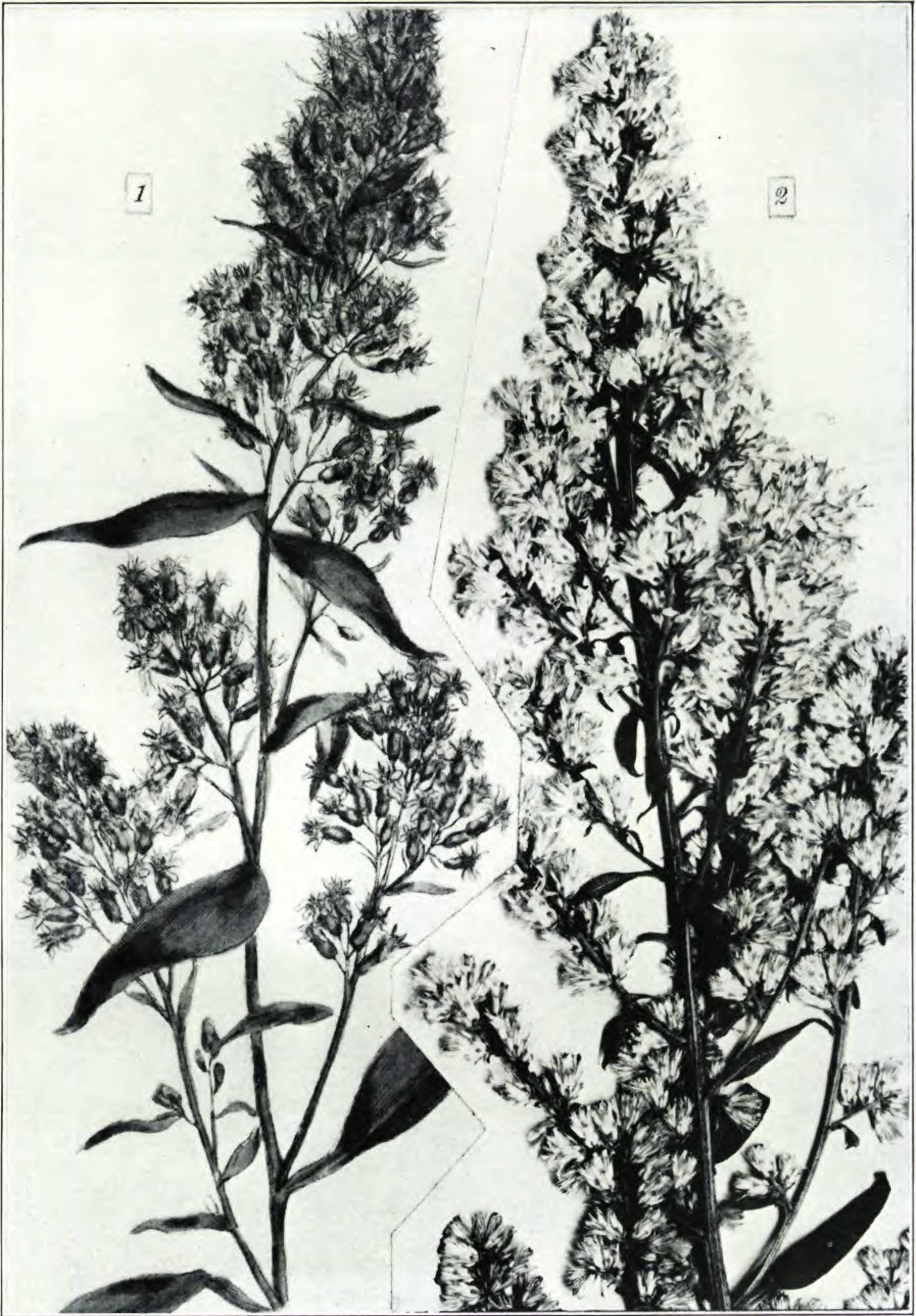


Photo. E. C. Ogden

SOLIDAGO CONFERTA: FIG. 1, inflorescence, $\times 1$, after Miller.
S. SPECIOSA: FIG. 2, upper half of inflorescence, $\times 1$, from Massachusetts.



Photo. E. C. Ogden

SOLIDAGO NEUROLEPIS: FIG. 1, TYPE, $\times \frac{2}{5}$; FIG. 2, lower surface of leaf, $\times 10$, from TYPE; FIG. 3, involucre, $\times 5$, from TYPE; FIG. 4, achene, pappus and disk-corolla, $\times 10$, from TYPE.

sleep where they lie. Among Miller's species which Gray, with the most profound knowledge of the types and their proper interpretation, refrained from placing as an identifiable American species was *S. conferta*.

Nevertheless, in recent years this name has been taken up with confident assurance to displace a perfectly valid and clearly typified name which had had a full century of accurate usage. One of the most definite species of eastern North America is *S. speciosa* Nutt., a tall (up to 2 m.) plant with coriaceous leaves and a thyrses made up of stiffish spiciform racemes of sessile or subsessile heads. The upper half of a characteristic inflorescence from Sheffield, Massachusetts (*F. Walters*) is shown, $\times 1$, in PLATE 420, FIG. 2. But in RHODORA, xxix. 17-19 (1927), the late Kenneth K. Mackenzie took up to replace Nuttall's perfectly familiar and unquestioned *S. speciosa* the name *S. conferta* Mill., asserting that

This species has been neglected because Miller failed to refer back to his finely illustrated work above referred to [Miller, Figs.] . . . In that work he . . . fully described (p. 170) under the same polynomial as in his later work and with practically identical description . . . the same species. . . his beautiful colored plate 254, fig. 2, one of the few colored plates of *Solidago* ever published, makes the identification of his species very certain.

Solidago conferta Miller is the species which many years later was called *Solidago speciosa* by Nuttall, and we must adopt the appropriate name of Miller instead of Nuttall's excellent name.

Most unfortunately many recent students have followed Mackenzie in discarding *S. speciosa* (PLATE 420, FIG. 2) for *S. conferta* (FIG. 1) and Mackenzie's characteristic positiveness would seem to justify such a procedure. Most of our students are not in a position to weigh such matters and they accept the latest pronouncement without healthy skepticism. Since Miller's plate 254, fig. 2, which unquestionably was his *S. conferta*, was to Mackenzie "very certain"ly *S. speciosa* I am reproducing the inflorescence, $\times 1$, as fig. 1, beside the upper half (fig. 2) of a characteristic thyrses of *S. speciosa*. Miller's plant was described by him correctly as having "The Flowers [*i. e.* heads] . . . produced in single loose Spikes from the lower Part of the Stalk at the Wings of the Leaves"—Mill. l. c. 170 (italics mine; the reference to *loose* spikes overlooked, or at least not mentioned by Mackenzie). The accurate characterization by Miller of the loose spikes and the very clear plate, showing the small heads on long filiform pedicels and the long foliaceous divergent bracts, are to me

very convincing reasons for not identifying Miller's garden plant, cultivated in England, with the American *S. speciosa*; and Mackenzie's certainty that the latter name should be thrown aside should serve as a caution to those who, it sometimes seems, are inclined to be more iconoclastic than precise in their identifications of old types.

What American species, if any, was the primary basis of *Solidago conferta* Mill. I do not know. The decidedly non-secund branches of the thyrses place it in the § *Virgaurea* which occurs abundantly in Europe. *S. uliginosa* Nutt. sometimes has the heads on long pedicels but never, so far as I have seen, divergent broadly lance-attenuate leafy bracts; and in the American allies of the European *S. Virgaurea* L. I know none which could safely be forced into *S. conferta*. My own inclination is to leave it, along with many which were specially noted by Gray, as a garden plant of Europe (reputedly of American origin) which cannot be positively identified with any species known to us in the wild.

Other cases of Mackenzie's unjustifiable abandonment of clearly typified and long established names for those which must always be open to question occur. The one here discussed and illustrated should suffice to put students of our flora on guard against such needless and groundless shifting of names.

SOLIDAGO JUNCEA Ait., forma **scabrella** (Torr. & Gray), comb. nov. *S. arguta*, γ. *scabrella* Torr. & Gray, Fl. N. Am. ii. 414 (1842). *S. juncea*, var. *scabrella* (Torr. & Gray) Gray, Syn. Fl. i². 155 (1884).

Supposed by Gray to be confined to the central states, but now known eastward to the limits of the specific range (Quebec and Virginia). The smooth-leaved typical *S. juncea* also extends as far west and southwest as the scabrous form.

S. JUNCEA Ait., forma **ramosa** (Porter & Britton), comb. nov. *S. juncea*, var. *ramosa* Porter & Britton in Bull. Torr. Bot. Cl. xviii. 368 (1891).

Originally from western New Jersey and adjacent Pennsylvania, Ohio and West Virginia, this form with erect branches occurs sporadically throughout the range of the species, at least eastward to New Brunswick and west to Michigan. It is a striking form but hardly a true geographic variety.

SOLIDAGO ARGUTA Ait., forma **tomophylla**, forma nov., foliis caulinis obovatis apice rotundatis vel subtruncatis margine grosse inciso-serratis.—NEW YORK: open pasture-slopes at 2100 feet alt.,

Maplecrest (Big Hollow), Green Co., August 26, 1931, *H. K. Svenson*, no. 4668 (TYPE in Gray Herb.).

Forma *tomophylla* is an extraordinary departure from typical *Solidago arguta*; but I can look upon it only as a sporadic variation such as occurs in several other species, exaggeration of the teeth appearing in individuals of *S. hispida* Muhl., *S. puberula* Nutt., *S. multiradiata* Ait., *S. Cutleri* Fern., *S. Randii* (Porter) Britton and numerous others. In *S. arguta*, forma *tomophylla*, however, the outline of the leaf is also aberrant. The sheet in the Gray Herbarium was collected on an excursion of the Torrey Botanical Club and the label says "Common on open pasture slopes, exposed to the south." In mid-August, 1935, Mr. E. C. Ogden and I searched the south-facing slopes above Maplecrest for it without success. *S. juncea* Ait. was abundant, *S. arguta* less so; but, if forma *tomophylla* still grows there, it successfully evaded us.

SOLIDAGO LUDOVICIANA (PLATE 422, FIGS. 2-5). In 1842, knowing the species only from about ten fragmentary specimens, Torrey & Gray treated *Solidago Boottii* Hook. as an all-inclusive species of five defined varieties. Later these varieties, originally designated without names, have received varietal and specific cognomens; and, with fuller material and understanding of their ranges, they are now practically all recognized as definite Alleghenian, Piedmont and Coastal Plain species. One of the latter has been not well understood, and since it is one of the most definite of the complex group it seems important to attempt clarification of it. Torrey & Gray had from Louisiana and Texas plants which they doubtfully placed with *S. Boottii* as

ε? glabrous; stem stout; leaves rigid, oblong, less acuminate, the lower serrate with spreading teeth; racemes dense, very numerous, forming an ample compound panicle.—T. & G. Fl. N. Am. ii. 214 (1842).

In 1882 Gray said under *S. Boottii*

Var. *LUDOVICIANA* is a dubious form, with larger heads and leaves.—Gray, Proc. Am. Acad. xvii. 195 (1882).

but in the Synoptical Flora he was more definite:

Var. **Ludoviciana**, Gray, l. c. Perhaps a distinct species, stouter, tall, rather large-leaved: lower leaves and lower part of the stem sometimes roughish-hirsute or hispidulous with many-jointed hairs, or glabrous: heads larger, even 4 lines long!—*S. Boottii*, var. ε, partly, Torr. & Gray, l. c.—W. Louisiana, *Hale*.—Gray, Synop. Fl. 1². 154 (1884).

Even as left by Gray in 1884 his *Solidago Boottii*, var. *ludoviciana* consisted of a plant with "lower leaves . . . roughish-hirsute or

hispidulous with many-jointed hairs" and another with them glabrous. A large series accumulated in recent years shows that the plants with hirsute leaves and those with them glabrous are, apparently, well defined species: the hirsute one *S. strigosa* Small, Fl. Se. U. S. 1198, 1339 (1903), correctly described with "blades strigose"; the glabrous one *S. ludoviciana* (Gray) Small, l. c. 1199, 1339 (1903), based on *S. Boottii*, var. *ludoviciana* Gray. Of the *Hale* material from western Louisiana marked by Gray as *S. Boottii*, var. *ludoviciana* there are two sheets: the one in the Torrey Herbarium is glabrous (TYPE of *S. ludoviciana* Small) and bears Gray's memorandum, "My specimen of this is hirsute"; the one in the Gray Herbarium is hirsute and bears Gray's memorandum, "The specimen in Hb. Torr. of var. ϵ ? is glabrous." Small having selected the glabrous plant of Hale to stand as the type of *S. ludoviciana*, that point is satisfactorily settled, the hirsute plant of Hale being *S. strigosa* Small. There are, as stated, many collections of both species now in the Herbarium of the New York Botanical Garden, where I have studied them, and in the Gray Herbarium; but, unfortunately, the late K. K. Mackenzie, rapidly becoming blind and suffering from a long-borne infection, apparently could not see them clearly, for at New York several sheets with the characteristic hirsuteness of *S. strigosa* were labelled by Mackenzie "*S. ludoviciana*." But the most puzzling confusion due to Mackenzie's distressing eye-sight in his later years arises in another connection.

Perplexed by certain inadequate specimens of the plant of southern New Jersey which has there passed as possibly *Solidago yadkinensis* (Porter) Small, I appealed to Mr. Bayard Long, who stated that the New Jersey plant has remained a problem for twenty-five years, a species readily recognizable and carefully accumulated in the local herbarium of the Academy of Natural Sciences of Philadelphia. Mr. Long kindly sent for study a large series of the New Jersey plant, a species of open sandy woods and thickets. In foliage, inflorescence, involucres, pappus, corollas and achenes it is a close match for *S. ludoviciana*, but all carefully collected New Jersey material has abundant filiform stolons and the autumnal rosettes have clearly arisen from such stolons. Otherwise the plant also superficially resembles *S. yadkinensis*, *S. Boottii* Hook. and *S. strigosa* Small.

In Mackenzie's treatment of *Solidago* in Small's Manual the three latter species, as well as *S. juncea* Ait., *S. arguta* Ait. and *S. Harrisii* Steele, all come under his *Argutae*, defined "Plant without long hori-

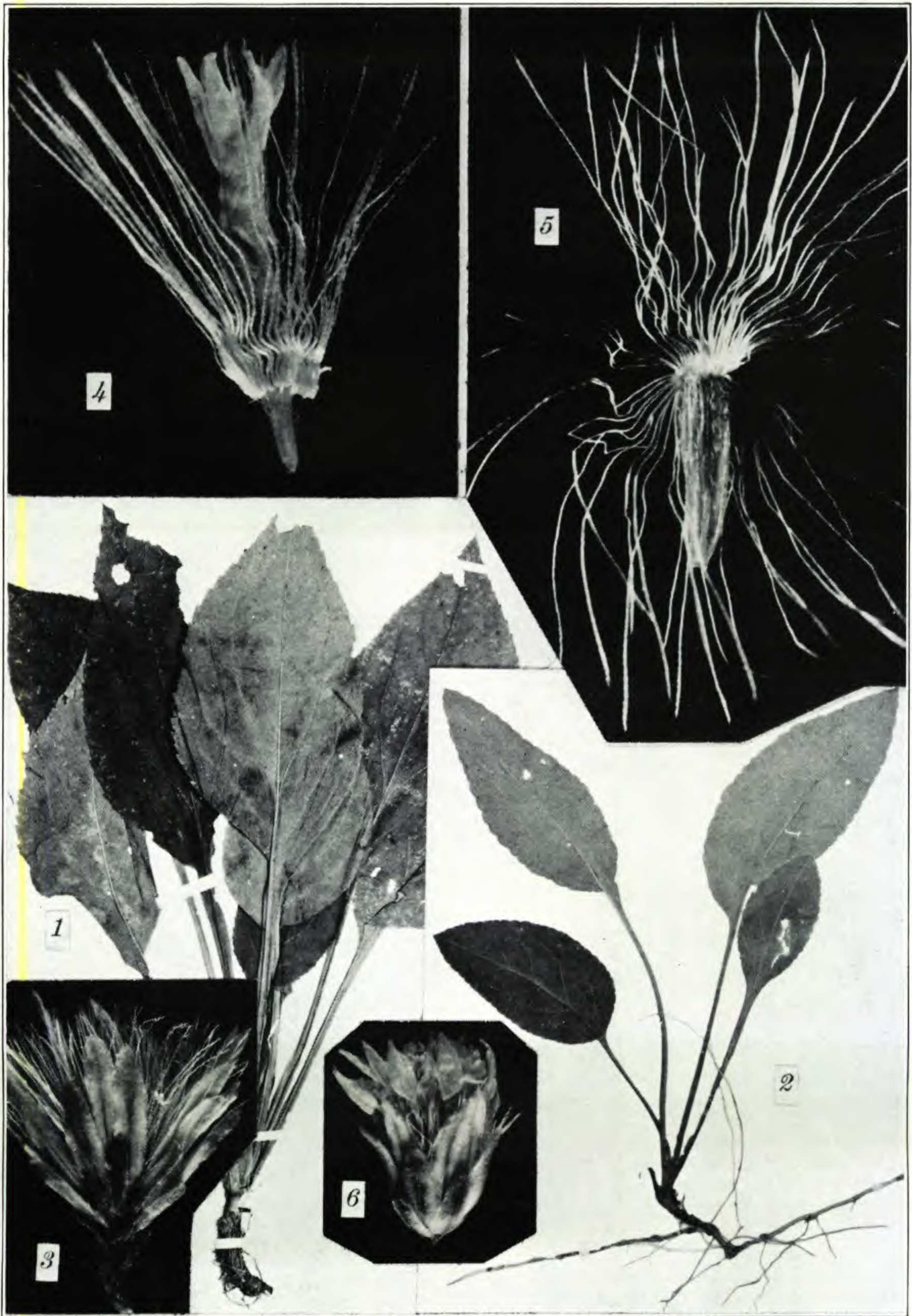


Photo. E. C. Ogden

SOLIDAGO NEUROLEPIS: FIG. 1, basal rosette, $\times \frac{2}{5}$, from TYPE.

S. LUDOVICIANA: FIG. 2, basal rosette, $\times \frac{2}{5}$, from Virginia; FIG. 3, involucre, $\times 5$, from TYPE; FIG. 4, disk-flower, $\times 10$, from Texas; FIG. 5, achene and pappus, $\times 10$, from New Jersey.

S. JUNCEA: FIG. 6, involucre, $\times 5$, from Massachusetts.



Photo. E. C. Ogden

SOLIDAGO ELLIOTII, var. TYPICA: plants, $\times \frac{2}{5}$, from South Carolina.

zontal stolons," etc. The other plants of similar aspect would seem to constitute Mackenzie's *Vernae*: "Plants with long slender horizontal stolons," etc. The *Vernae* of Mackenzie are assigned two species, *S. verna* M. A. Curtis and the new *S. tarda* Mackenzie in Small, Man. 1355, 1509 (1933). I have studied at New York and now have on loan the type of *S. tarda*. In every way it is matched by the freely stoloniferous New Jersey material which is otherwise identical with the type of *S. ludoviciana*. Consequently, it is most significant to find that carefully collected material of *S. ludoviciana* displays the stolons (A. A. & E. G. Heller, no. 4122 from Arkansas and E. J. Palmer's no. 31714a from Gumwood, Texas—distributed without identification). The identity of *S. tarda* with *S. ludoviciana* seems sufficiently clear. Late in the autumn it produces filiform stolons (FIG. 2); but no material in the two large herbaria studied shows any such tendency in *S. yadkinensis*, the only species with which it might be confused, but from which *S. ludoviciana* differs in having the basal leaves broader and more abruptly contracted at base and less acuminate, the involucre (FIG. 3) even larger, 5–8 mm. high (against 5–6.5), the pappus (FIGS. 4 and 5) 4–5 mm. long (in *S. yadkinensis* 3–4), the disk-corollas (FIG. 4) 4.5–5.5 mm. long (in *S. yadkinensis* 4–4.5) and the achenes (FIG. 5) 2–2.8 mm. long (against 1.5–2.2). Incidentally the flowering periods of the two are quite different. *S. yadkinensis*, chiefly an Alleghenian and Piedmont species, flowers early: July 24–31 in Virginia, late June to early August in North Carolina, August in Georgia, the type, in fruit, collected at the Falls of the Yadkin on August 18th. *S. ludoviciana* is a species chiefly of the Coastal Plain, from Arkansas and eastern Texas to Georgia and in eastern Virginia (locally) and southern New Jersey (more frequently). In New Jersey the specimens in anthesis (rare in the woods, more frequent in the open) were collected from September 4 to October 6; the type of *S. tarda*, barely in flower, was collected in Clarke Co., Georgia on October 20th. There is, then, a difference of several weeks in the flowering periods of the two species.

Although the production of filiform stolons seems to be a specific trait of *Solidago ludoviciana* and their non-production a character of *S. yadkinensis*, *S. Boottii*, *S. Harrisii* and *S. arguta*, the character should be used with caution. In all the material of *S. verna*, including the type collection of M. A. Curtis, at Cambridge and at New York I can find no stolons, yet Mackenzie certainly inferred them when he

defined the *Vernae* "with long slender horizontal stolons." In *S. strigosa* which he placed in the *Argutae* "without long horizontal stolons," there are 16 sheets before me. Of these, 13 are either broken off or jerked up, showing no well collected bases; but in *Caroline Dormon's* no. 1 from Natchitoches Parish, Louisiana, the carefully dug base shows the filiform stolons, quite like those of *S. ludoviciana*. On account of these stolons which he specially noted on the sheet, Mackenzie identified the collection as *S. tarda*, but the basal leaves have the characteristic pubescence of *S. strigosa*, not the glabrous surfaces of *S. tarda* (i. e. *S. ludoviciana*). Nevertheless *S. strigosa* can hardly be treated as hirsute *S. ludoviciana*. Its involucre are only 3.5–4.5 mm. high (in *S. ludoviciana* 5–8), its pappus only 2.5–4 mm. long (in *S. ludoviciana* 4–5) and its disk-corollas only 3.5–4 mm. long (in *S. ludoviciana* 4.5–5.5).

The quick way to tell the eastern *Solidago juncea* Ait. from the western *S. missouriensis* Nutt. is by their bases: *S. missouriensis* (with narrow "triple-nerved" leaves), even when pulled up displays filiform stolons; *S. juncea* (with the broader leaves not "triple-nerved") practically never has such stolons. Nevertheless, in the sandy southeastern section of Massachusetts (Cape Cod, Martha's Vineyard, etc.) *S. juncea* with characteristic foliage, involucre and achenes, frequently develops stolons as slender and elongate as does the regularly stoloniferous *S. missouriensis*.

The character, therefore, is one to be used only after critical study and abundant experience. The development of filiform stolons in the late-flowering *Solidago ludoviciana* (*S. tarda*) seems to be a character of value in separating it from the early-flowering *S. yadkinensis*, which, as Messrs. Long, Fogg and I were able to check in eastern Virginia, bears a large rosette on a stout caudex, from which finally the flowering stem arises.

SOLIDAGO neurolepis, sp. nov. (TAB. 421 et TAB. 422, FIG. 1), *S. strigosae* similis; caule 1–1.5 m. alto glabro vel superne sparse piloso, foliis subcoriaceis supra glabris vel minute scabridulis subtus ad nervos hispidis vel glabratiss; foliis rosulatis longe petiolatis petiolis marginatis, laminis oblongo-ovatis 8–17 cm. longis 4.5–10.5 cm. latis grosse serratis, dentibus apice subulatis, basi rotundatis apice acuminatis; foliis caulinis 30–40 imis mediisque oblongo-ovatis vel -obovatis subsessilibus grosse acuteque serratis, superioribus reductis integris; inflorescentia paniculata laxa ramis remotis adscendentibus vel patentibus secundis, inferioribus ad apicem floriferis, superioribus per totam longitudinem floriferis; pedicellis brevibus erectis; involucris

cylindricis 3.5–4.5 mm. altis, bracteis stramineis valde inaequalibus, exterioribus perbrevis lanceolato-attenuatis, intermediis lanceolato-attenuatis valde costatis costa glutinosa, interioribus linearibus sub-acutis vel obtusis; disci floribus 4 vel 5, tubo 1–1.5 mm. longo, fauce 1 mm. longo, lobis 0.6–0.8 mm. longis; ligulis 3 vel 4 ca. 0.3 mm. latis; pappi setis 2–2.5 mm. longis; achaeniis maturis 1.3–1.5 mm. longis strigosis.—MISSOURI: dry bank, open woods, Oronogo, Jasper Co., August 29, 1920, *E. J. Palmer*, no. 18,863, distributed as *S. juncea* var. *scabrella*.

Solidago neurolepis, presumably on account of its large basal rosettes (PLATE 422, FIG. 1), was mistaken by Palmer for *S. juncea* and later, by Mackenzie, for *S. ludoviciana*. *S. juncea*, however, has the basal leaves narrower and more tapering at base, without the bristly ciliation of the nerves beneath; its cauline leaves are narrower and more rapidly decreasing upward; its involucre (PLATE 422, FIG. 6) hemispherical, with oblong and blunt bracts, its disk-flowers about 10 and its ligules 8–12. *S. neurolepis* is sufficiently distinct from it in the rounder-based leaves, with characteristic pubescence (PLATE 421, FIG. 2) beneath, the broad and sharply toothed median cauline leaves, the slender heads (FIG. 3) with attenuate bracts and the few flowers. *S. ludoviciana*, as shown on p. 210, has the base (PLATE 422, FIG. 2) with filiform rhizomes and stolons, the leaves quite glabrous, the campanulate involucre (FIG. 3) very large (5–8 mm. high), with oblong and obtuse bracts, with midrib dilated upward, the disk-corollas (FIG. 4) 8–10 and 4.5–5.5 mm. long, the ligules about as numerous and unusually broad, the achenes (FIG. 5) 2–3 mm. long, with pappus 4–5 mm. long.

In habit and large rosette-leaves with veins hispid or hirsute beneath *Solidago neurolepis* is somewhat like *S. strigosa* Small, but that species, like *S. ludoviciana*, is slenderly stoloniferous, and its heads are much fuller than in *S. neurolepis* and with obtuse linear-oblong bracts.

THE VARIATIONS OF *SOLIDAGO ELLIOTTII* (PLATES 423–425). *Solidago Elliottii* Torr & Gray was originally conceived as a plant of North and South Carolina and Georgia, its type being a specimen from Parris Island collected by Stephen Elliott. Among other characters it had “leaves . . . oblong-lanceolate or elliptical, mucronate-acute or somewhat acuminate . . . veiny, . . . , heads in crowded recurved racemes.” It was supposed to be the *S. elliptica* of Elliott, not Ait. At the same time Torrey & Gray

supposed a more northern plant to be *S. elliptica* Ait., but subsequently Gray cast doubt on the identity of Aiton's *S. elliptica* with any indigenous American plant: "Cultivated from early times in European gardens, not identified as indigenous";¹ and at that time he referred the northern plant to the southern *S. Elliottii*, a course which has been followed by most later students. The only doubt of this identity seems to be the comment by Mackenzie in Small's Manual in his treatment of *S. Elliottii*: "This species seems to be known only from the original specimen from Parris Island, S. C. Specimens ranging all the way from eastern Georgia to eastern Canada have been erroneously referred to it."

Material of the original Parris Island plant preserved in the Torrey Herbarium (with fragments in the Gray Herbarium) agrees with much other material from South Carolina in having elliptical short-tipped, not long-acuminate leaves, and a panicle with strongly divergent or recurving racemes.

In these two characters it is quite distinct from the plant of swamps from Delaware to eastern Massachusetts and Nova Scotia. The latter has the leaves mostly narrower and long-acuminate and the panicle with strongly ascending to barely spreading branches and the foliaceous bracts are usually more developed. Some collections, especially from Rhode Island, strongly approach the South Carolina plant in habit but they have the leaves prolonged as in the usual New England plant. In the details of the heads I find essentially no difference. The South Carolina material (true *S. Elliottii*) has the involucre 4.5–5.5 mm. high, its median bracts 0.8–1 mm. broad, the disk-corollas 4.5–5.5 mm. long with lobes 1.5–2 mm. long, the pappus 3.5–4.5 mm. long and the ripe achenes 1.5–1.8 mm. long. The northern series shows similar measurements, with slightly more variation (due to more abundant material): involucre up to 6.5 mm. high and disk-corollas 4–5 mm. long. There is certainly not enough difference to keep the two series apart as species.

In eastern Virginia *Solidago Elliottii* is represented by a plant with the foliage much as in the northern variety but with a pyramidal open panicle with spreading branches and long-pedicels, the former character reminiscent of true *S. Elliottii*. But this Virginian plant has the involucre and flowers small for the species: involucre 3.5–4.5 mm. high, with the median bracts only 0.5 mm. broad, disk-corollas

¹ Gray, Syn. Fl. N. A. i². 143 (1884).



Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. ASCENDENS: TYPE, $\times \frac{2}{5}$.

4–4.2 mm. long, pappus only about 3–3.5 mm. long, and achenes only 1.2 mm. long. It thus approaches *S. rugosa* Mill., var. *sphagnophila* Graves, but that has the small involucre (3–4 mm. long) crowded and short-pedicelled, the smaller disk-corollas (2.5–3.5 mm. long) with lobes only about 1 mm. long, and the short pappus (2–2.5 mm. long) of *S. rugosa*. I am, therefore, tentatively treating the plant of eastern Virginia as a variety of *S. Elliottii*.

Farther south, in Florida, *Solidago Edisoniana* Mackenzie has the aspect of the northern variety of *S. Elliottii*, with the foliose panicle with strongly ascending branches, but its leaves are firmer and more prominently toothed. Its involucre, disk-corollas, and pappus give the same measurements and proportions, except that the pappus may be a fraction of a millimeter longer.

It seems to me, therefore, that *Solidago Elliottii* is best treated as a polymorphous species of the Coastal Plain and adjacent provinces, characterized as a species by its glabrous stems, rachis and foliage, and its large heads (involucre 3.5–6.5 mm. high), broadish, blunt bracts (the median 0.5–1 mm. wide), long disk-corollas (4–5.5 mm. long) with lobes 1.5–2 mm. long, long pappus (3–5 mm. long) and large ligules (0.5–1 mm. broad). It seems to have four geographic varieties:

S. ELLIOTTII Torr & Gray, var. **typica**. *S. Elliottii* Torr. & Gray, Fl. N. Am. ii. 218 (1842); Gray, Syn. Fl. i.² (1884), as to southern plant only; Mackenzie in Small, Man. 1358 (1933).—Swamps of North and South Carolina and Georgia. PLATE 423.

Var. **ascendens**, var. nov. (TAB. 424), foliis oblanceolatis vel oblongis acuminatis submembranaceis; ramis panicularum valde ascendentibus; involucris 4.5–6.5 mm. altis breviter pedicellatis, bracteis mediis 0.7–1 mm. latis; disci corollis 4–5 mm. longis lobis 1.5–2 mm. longis; antheris 1.5–2 mm. longis; pappi setis 3.5–4.5 mm. longis; achaeniis 1.5–1.8 mm. longis.—Swamps and wet thickets, Delaware to eastern Massachusetts; western Nova Scotia. TYPE: sandy thicket, Harwich, Massachusetts, September 21, 1927, *M. L., Katharine and H. G. Fernald* in Pl. Exsicc. Gray. no. 492 (in Gray Herb.).

Var. *ascendens* is the plant which was mistakenly called *Solidago elliptica* Ait. by Gray. It has generally passed as *S. Elliottii* in the northern Manuals. Freely hybridizing with *S. rugosa* and *S. rugosa*, var. *sphagnophila*. *S. Elliottii*, var. *divaricata* Fernald, RHODORA, xvii. 7 (1915) is a hybrid of var. *ascendens* and *S. rugosa*, var. *typica*.

Var. **pedicellata**, var. nov. (TAB. 425), foliis oblanceolatis vel

elliptico-lanceolatis acuminatis, membranaceis; ramis panicularum laxe patentibus; involucris 3.5–4.5 mm. altis longe pedicellatis, bracteis mediis 0.5 mm. latis; disci corollis 4–4.2 mm. longis; pappi setis 3–3.5 mm. longis; achaeniis 1.2 mm. longis.—Eastern Virginia. TYPE: border of wet pine woods, Eastville, October 12, 1935, *Fernald & Long*, no. 5520 (in Gray Herb.)

A plant in young bud only, from bushy clearings and borders of woods west of Hampton, Virginia (*Fernald, Long & Fogg*, no. 5091) is apparently the same.

Var. **Edisoniana** (Mackenzie), comb. nov. *S. Edisoniana* Mackenzie in Small, 1358 (1933).

THE *SOLIDAGO RUGOSA* COMPLEX (PLATES 426–430). Probably no aggregate-species of *Solidago* in America, unless it be the *canadensis* group, is more baffling in its variations than *S. rugosa* Mill. (including *S. aspera* Ait.) . Already difficult enough as a series of plants, its elucidation has not been helped by the interpretation of the late K. K. Mackenzie.¹ Wandering through the mazes of the always vague and often inconclusive pre-Linnean accounts and drawings of plants in European gardens prior to 1753, the initial date of our nomenclature, he concluded that the plant which Linnaeus had cultivated at Upsala and described as *S. altissima*, “*SOLIDAGO paniculata-corymbosa, racemis recurvis, floribus adscendentibus, foliis nerviis subintegerrimis*,”² is *S. rugosa* Mill. Early botanists had identified our inclusive *S. rugosa* as *S. altissima*, but Asa Gray, after a life-time of actual study of the original specimens in *Solidago*, settled the matter for all who wish it settled by showing that *S. altissima* must stand for the relative of *S. canadensis* “with thicker and more obscurely triple-nerved leaves than ordinary *S. Canadensis*”; and that the specimen in the much altered and disturbed Linnean herbarium of today, bearing the name *S. altissima* and belonging to *S. rugosa*, was so labeled by Sir J. E. Smith after the death of Linnaeus and cannot be accepted as in any way the Linnean type: “A specimen ticketed . . . by Smith ‘*altissima*’, is the species which has so long [erroneously] passed as *S. altissima*, viz. *S. rugosa*.”³ In the study referred to, Gray concluded that for the plant (our *S. rugosa*) which had erroneously passed as *S. altissima* “we must now fall back to the oldest and in the main most appropriate name, *S. rugosa*, Mill. Dict.”⁴

¹ Mackenzie in RHODORA, xxix. 75 (1927).

² L. Sp. Pl. ii. 878 (1753).

³ Gray, Proc. Am. Acad. xvii. 177 (1882).

⁴ Gray, l. c. 180.

Gray's decisions were based upon a thorough and dispassionate weighing of the complicated evidence and nothing is gained by attempts to overthrow his decisions merely on the basis of sophisticated bibliographic twists without fuller knowledge of the actual specimens which Linnaeus had before him. Incidentally it should be noted that the original Linnean account (*Hortus Upsal.* 259) in 1748 said of his *S. altissima* "foliis enerviis integerrimis," a phrase altered in 1753 (our starting point) by changing *integerrimis* to *subintegerrimis*.

The original (1748) account by Linnaeus amplified the brief diagnosis by a series of comparisons with the preceding species, *S. canadensis* L.

Obs. *Praecedenti valde affinis a qua differt:* 1. Foliis crassioribus, margine vix vel parum scabris, superficie vix manifeste trinervi. 2. Caule duplo altiore, seu quadrupedali. 3. Tempore florendi seriore, scilicet octobri.

Mackenzie's own description of *S. rugosa* (his "*S. altissima*") in Small's Manual reads: "leaf-blades . . . sharply-serrate, . . . thin, prominently veined." Surely, it is most difficult to coordinate Mackenzie's "*S. altissima*" (*S. rugosa*), with sharply serrate, thin, prominently veined leaves with the Linnean account of a plant with entire (or subentire), thick leaves with veins not apparent. Gray's wise decision should be accepted as definitely settling the specific identities; nothing but confusion follows by insisting that by entire, thick and veinless Linnaeus really meant sharply serrate, thin and prominently veined!

As to Mackenzie's insistence that *Solidago altissima* L. is not the tall thick- and often entire-leaved plant with which Gray and afterward I, merely following Gray, identified it, it is noteworthy that the original Linnean account said that the plant flowers later (in October) than *S. canadensis* and that it came from Maryland. As represented in the Gray Herbarium *S. canadensis* is little shown from Maryland southward, while *S. altissima* of Gray's and my own interpretation is more abundant, being the most abundant species of eastern Maryland and Virginia. The *flowering* material bears the following dates:

S. CANADENSIS. From Maryland, September 16; from West Virginia, September 5 and 10.

S. ALTISSIMA. From Maryland, September 16 and 24; from West Virginia, September 22, October 3 and 19; from Virginia, September 23, October 14 and 20.

I see no grounds for upsetting the use of *S. altissima* for the plant so treated in Gray's Manual.

There is, however, the necessity to settle just which of the numerous variations within the complex series we call *Solidago rugosa* Philip Miller had. So long as the group was treated merely as "Polymorphous, not readily sorted into definable varieties," Gray's treatment in the Synoptical Flora, the question could be passed. But now that we know the thin-leaved plant with elongate and acuminate, sharply serrate, smooth or merely villous-backed blades to have the involucre bracts also thin and elongate (linear-lanceolate and tapering to tip) and to have a broad northern range, while the plants with thicker, firmer and more rugose and harshly scabrous leaves have the involucre bracts commonly linear and round-tipped, and are prevailingly of southern range, the exact identity of Miller's plant becomes important.

Probably there is no type extant for *Solidago rugosa*. Miller's description (species no. 25, Gard. Dict. ed. 8) is not wholly satisfactory, especially his *entire* leaves; but the garden plant was said to have come from New England, to have hairy, round stems 2½ feet high, lanceolate, rough leaves, "those on the lower part are two inches long, and half an inch broad, but are gradually smaller to the top," panicle loose, with long lower branches with intermixed leaves. This, in view of Miller's lack of understanding of more technical characters in *Solidago*, is well enough and nothing will be gained by changing the interpretation of *S. rugosa* as now generally understood. William Aiton (or presumably Solander), who was a contemporary of Miller and had material of his species growing at Kew, supposed *S. rugosa* to be *S. altissima* L., as already sufficiently emphasized. Aiton divided the "*S. altissima*" growing then at Kew into five unnamed varieties, his *S. altissima* ϵ being what was then understood by Miller's contemporaries as *S. rugosa*, a plant with the habit and narrow-based and acuminate leaves of northern *S. rugosa* but with the margins entire or only barely toothed. That this garden material is quite like the plant which Miller had there can be little doubt. It is the extreme of ordinary *S. rugosa*, as currently understood, with the least developed toothing. The other plants which Aiton associated with it, his *S. altissima* vars. α , β , γ and δ , are slight variations of the same thing, differing in breadth of leaf, toothing of the margin and elongation of panicle-branches. I have before me photographs of all these trivial variations which I took at the British Museum in 1903. They all belong to *S. rugosa* as usually interpreted. In 1814 Pursh took

up three of Aiton's unnamed varieties and assigned them names under *S. altissima*, with the pregnant comment: "It is a very variable species, and scarcely two individuals look alike." Another of Aiton's varieties, his *S. altissima* ϵ , which Aiton had considered to be *S. rugosa* Mill. (Aiton's material closely matching Miller's description), was treated by Pursh unequivocally as *S. rugosa*; and another, *S. altissima* β . of Aiton, (said by Aiton to be *S. pilosa* Miller) Pursh treated as synonymous with his new *S. villosa*. The type of Aiton's *S. altissima* β = *S. pilosa* Mill., however, is only a slight transition toward the type of *S. villosa* Pursh, photographs of both being before me.

Typical *Solidago rugosa* passes into the ecological var. *villosa*, which was *S. villosa* Pursh. These two plants, predominantly northern and of damp habitats, have usually villous stems, lanceolate to narrowly ovate or oblanceolate, usually sharply serrate leaves which are narrowed to base and acuminate at tip, rather thin, only slightly harsh above, villous-hirsute on the loose but not prominently rugose veins beneath, and their involucral bracts are thin (subherbaceous), greenish and linear or linear-lanceolate and tapering or only subobtusate at tip.

In drier, often quite dry, habitats of the South, extending into the warmer parts of the North, there is another series, *S. aspera* Ait. and *S. celtidifolia* Small, with the stems scabrous-puberulent or short-hirsute (rarely villous); the leaves from lanceolate to rounded-ovate and firm, harshly scabrous above, coarsely rugose-veiny and scabrous-hirsute beneath, the bases mostly rounded and the margins with low or crenate teeth. In these two plants the involucral bracts are rather firm, linear to linear-oblong and usually round-tipped. In their extreme developments they would seem to constitute a separate species, but, unfortunately, too many transitions in leaf-outline, toothing, and involucre occur to allow me to treat them as specifically distinct from *S. rugosa*. Their corollas, pappus and achenes are, likewise, not materially different and I am looking upon them as a pair of somewhat xerophytic austral varieties. This interpretation is strengthened by the fact that the type and a few other extreme specimens of *S. celtidifolia* have the involucral bracts as slender and as thin as in the more northern typical *S. rugosa*, but decidedly longer.

Another series which is quite baffling is the group of glabrous plants which was set off as *Solidago rugosa*, var. *sphagnophila* by Graves in 1904 and, eleven years later, as *S. aestivalis* Bicknell. When Bicknell

described this glabrous plant as a species he correctly characterized it as

closely related to *S. rugosa*, but having a much earlier flowering period, . . . three to five weeks in advance of *S. rugosa* and much of it . . . past flowering at the time the latter begins to bloom. The close relationship of *S. aestivalis* to *S. rugosa* is evident enough, and examples are not wanting that suggest either that the two are sometimes intergradient or that they occasionally hybridize. Nevertheless it would be little doubted, I think, by anyone coming to know *S. aestivalis*, that it was essentially distinct, and long ago it became to me an authentic and, from its early time of flowering, a particularly interesting member of the golden-rod group. Its smooth and purple striate-angled stem is notably at contrast with the more terete and papillate-hirsute or villous stem of normal *S. rugosa*, although its smoothness may not be taken as a strictly determining character, for *S. rugosa* occasionally passes into glabrate forms; but such divergent plants, as I have met with them on Long Island, are obviously only local variations from the type not at all to be correlated with the normally glabrous stemmed *S. aestivalis*. In view of such variations, however, the characters of the latter might be given less weight did not its definitely earlier flowering period, both in its beginning and ending, imply a very pronounced remove from identity with the broadly similar *S. rugosa*.¹

Bicknell's discussion will be seconded by all who know the smooth plant of the Coastal Plain and the Piedmont; its early flowering is very real, but the flowering season, as shown in the abundant herbarium material from southern New England, overlaps that of *S. rugosa* more than he found to be the case on Long Island. The striate-angling of the stem is evident in most material, though occasionally not apparent, and too often in both the northern and inland villous-stemmed *S. rugosa* and in the southern scabrous-hispid *S. aspera* the pronounced angles can be seen (obscured only by the presence of a blanketing pubescence). In plates 426 to 429 I show such stems from the different plants of the group, merely to indicate the difficulty encountered in applying this character as a truly distinctive one.

Bicknell's characterization calls for involucreal "bracts linear-oblong to linear, obtuse" as in *S. aspera* and much of *S. celtidifolia*, and in slightly more than half of the material in the Gray Herbarium that is the case; but in the remainder, including some of the type-collection of *S. rugosa*, var. *sphagnophila*, the bracts are as narrow and attenuate as in the most ideal *S. rugosa*. Yet it can scarcely be maintained that Dr. Graves's variety is different from Bicknell's species. Graves's original account called for "Stems . . . angular-striate, very

¹ Bicknell, Bull. Torr. Bot. Cl. xlii. 561, 562 (1915).

smooth, usually dark red or purple . . . involucre . . . its bracts . . . linear-subulate to oblong-linear, acute or obtuse” and Graves gave a discussion very similar to that of Bicknell eleven years later!

As to whether it should be looked upon as specifically distinct from *S. rugosa* there might be an honest difference of opinion, but on account of the discovery of a few plants showing intermediate characters it seems best to regard it as a well marked variety of that species. . . . Not the least interesting feature of this variety is its time of flowering. It is one of our early goldenrods, following close after *S. juncea*, Ait., and *S. odora*, Ait., and antedating *S. rugosa* in the same neighborhood by at least four weeks. This past summer it began to bloom about August first, was well in flower a week or ten days later, and by the end of the month—at a time when the species was barely beginning—the variety was practically out of bloom. . . .

It is readily distinguished from the species by its perfectly smooth, more striate and usually darker stem, and its relatively smooth leaves. Its early flowering season and its habitat also constitute significant points of distinction.¹

There is much to say for recognizing *Solidago aestivalis* as a species, but I am so constituted that I cannot accept as true species in *Solidago* plants without definite morphological differences. I have vainly sought stable characters of corollas, achenes, pappus and anthers, such as clearly separate these plants from *S. Elliottii* and such as separate all other habitally similar but morphologically distinct species. I should welcome the designation of such characters by those who prefer to call *S. aestivalis* a species; but I am forced, until a new light is shed on the question, to treat *S. aestivalis* as *S. rugosa*, var. *sphagnophila* Graves.

The following brief summary gives the conclusions I reach in studying the group of *Solidago rugosa*. Since the group is so complex I have felt it important for clarity to illustrate each of the varieties I recognize. I have also added some details of involucre, etc. which may be of service.

S. RUGOSA Mill., var. **typica**. *S. rugosa* Mill. Gard. Dict. ed. 8, no. 25 (1768); Pursh, Fl. ii. 337 (1814), and later authors in part. *Virga aurea Novae Angliae, rugosis foliis crenatis* Dill. Hort. Elth. 416, t. cccvii. fig. 396 (1732), very similar to Miller's description and to the Hort. Kew material which Aiton, and after him Pursh, considered *S. rugosa*; the name used by Miller probably derived from Dillenius or from Hermann before him. *S. pilosa* Mill., l. c. no. 9 (1768), as interpreted by Aiton. *S. virginiana* Mill., l. c. no. 11 (1768), as inter-

¹ GRAVES, RHODORA, vi. 83, 184 (1904).

puted by Aiton and by Pursh. *S. recurvata* Mill. l. c. no. 28 (1768), as interpreted by Aiton and by Pursh. *S. altissima* Ait. Hort. Kew. iii. 212 (1789),¹ including vars.; Pursh, l. c. 336 (1814); Torr. & Gray, Fl. ii. 216 (1842), in part; Mackenzie in RHODORA, xxix. 75 (1927) and in Small, Man. 1358 (1933), not L. Sp. Pl. ii. 878 (1753). *S. altissima*, α . *vulgaris*, β . *recurvata* (Mill.) and γ . *virginiana* (Mill.) Pursh, l. c. (1814). *S. altissima*, var. *rugosa* (Mill.) Torr. Fl. N. Y. i. 363 (1843).—Stem sordid-villous, without or with decurrent lines running down the stem from the leaf-bases and midribs; leaves lanceolate to narrowly ovate or oblanceolate, acuminate, gradually tapering at base, commonly sharp-serrate with coarse teeth, usually rather thin and loosely veiny, not conspicuously rugose, more or less villous beneath; the median leaves 0.5–1.3 cm. long; the upper leaves gradually reduced in size, 1–7 cm. long, 0.5–1.5 cm. broad, much shorter than the long curving lower branches of the usually broadly pyramidal panicle; involucre 3–4 mm. high, their bracts linear or linear-lanceolate, thin, greenish, attenuate to bluntish.—Damp open soil, thickets and borders of woods and streams, Newfoundland to Ontario, south to western Virginia, West Virginia and Louisiana, abundant northward, less so southward. Flowering August–October. Passing into vars. *villosa*, *aspera* and *sphagnophila*. PLATE 426.

Vars. *glabrata* and *laevicaulis* Farwell, Am. Midl. Nat. ix. 277 (1925) have the characteristic pubescence through the panicle and on the lower leaf-surfaces, but their stems below the panicle are glabrous.

Var. *VILLOSA* (Pursh) Fernald in RHODORA, x. 91 (1908). *S. villosa* Pursh, Fl. ii. 537 (1814). *S. altissima*, var. *villosa* (Pursh) Torr. Fl. N. Y. i. 363 (1843), at least as to source of name.—Panicle elongate-pyramidal to cylindric, the lower lateral racemes nearly equaled to overtopped by the large (0.5–1 dm. long, 1–3.5 cm. broad) subtending leaves; involucre as in var. *typica*, often slightly larger; pubescence as in var. *typica* or longer and more copious.—Low grounds, Newfoundland to Ontario, often the abundant form, becoming infrequent southward to Virginia, West Virginia, Ohio and Michigan. Flowering from early July (northward) to October (southward). PLATE 427.

Var. *SPHAGNOPHILA* Graves in RHODORA, vi. 183 (1904). *S. aestivalis* Bickn. in Bull. Torr. Bot. Cl. xlii. 561 (1915).—Stems glabrous, often purplish, commonly with prominent stripe-like ridges decurrent from the bases of the leaves; leaves glabrous, lanceolate to narrowly elliptic, rather firm, appressed-serrate, the median 0.6–1.2 dm. long, the upper reduced; panicle much as in var. *typica* or more compact, its rachis and branches glabrous or only sparsely pubescent; involucral bracts linear-lanceolate to linear-oblong, acute or obtuse.—Swampy, often boggy, habitats, southern Maine to North Carolina. Flowering through August and September. PLATE 428.

¹ Aiton's treatment taken over for the most part by Willd. Sp. Pl. iii³. 2058 (1804) with the acknowledgment: "*Varietatem* α . *tandem vidi*, a *Clariss. Aiton indicatas vero non*. W.



Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. TYPICA: FIG. 1, plant, $\times \frac{2}{5}$, from Connecticut; FIG. 2, internode and leaf-bases, $\times 5$, from Maine; FIG. 3, lower surface of leaf, $\times 10$, from Nova Scotia; FIG. 4, involucre, $\times 5$, from same specimen.



Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. VILLOSA: FIG. 1, inflorescence, $\times \frac{2}{5}$, from Quebec; FIG. 2, inflorescence, $\times \frac{2}{5}$, from Magdalen Islands; FIG. 3, internode and base of leaf, $\times 5$, from Newfoundland; FIG. 4, involucre, $\times 5$, from same plant as FIG. 1.

Var. ASPERA (Ait.) Fernald in RHODORA, xvii. 7 (1915). *Virga aurea Americana aspera* Dill. Hort. Elth. 411, t. cccv. fig. 392 (1732). *S. aspera* Ait. Hort. Kew. iii. 212 (1789); Willd. Sp. Pl. iii³. 2057 (1804); Pursh, Fl. 535 (1814), and later authors. *S. altissima* ϵ , Torr. & Gray, Fl. ii. 217 (1842).—Stems scabrous-puberulent or short-hispid, rarely glabrous, terete or only occasionally angulate-striate; leaves oval or elliptic to lanceolate, rounded at base, subacute to short-acuminate, low-serrate to crenate, sometimes coarsely serrate, scabrous on both surfaces, thick and strongly rugose, the lower surface hispid; median leaves 2.5–10 cm. long, 1.2–4 cm. broad; panicle pyramidal, usually longer than broad, its ascending to spreading branches densely floriferous throughout or the lower sometimes merely leafy-bracted below, the reduced rameal leaves elliptic to lanceolate and acute; involucre 3–4 mm. high; their principal bracts firm, stramineous to pale-green, linear-oblong and round-tipped, 0.4–0.8 mm. broad.—Dry to damp open soil or thin woods and thickets, Florida to Texas, north to southern Maine, Ohio, Michigan and Missouri. Flowering from mid-August to October. PLATE 429.

Although var. *aspera* often appears quite distinct and, as already noted, is of generally more southern range and of drier habitats than var. *typica*, I find altogether too many transitions to justify maintaining it as a species. In view of the consistent and correct application of Aiton's name *aspera*, derived from Dillenius (1732), for more than two centuries, I am purposely maintaining the name in the varietal category, although extreme literalists, who place more weight on the letter of rules than their spirit, might urge my making a new combination based upon *S. aspera* var. *axillaris* Farwell, Rep. Mich. Acad. Sci. xiv. 189 (1913). Needless confusion would result by abandoning the bicentenarian and perfectly understood name *aspera* in its broadly inclusive sense and substituting, on a technicality, a name which was not so intended but which was definitely made subordinate to *aspera* and meant for a minor variation of it. I decline to be technically literal and to make a fetish of minor rules where only confusion and misunderstanding would result. Others, who look upon nomenclature as the end, not the means, will take another view.

Var. *aspera* passes into the following:

Var. **celtidifolia** (Small), comb. nov. *S. celtidifolia* Small, Fl. Se. U.S. 1198, 1339 (1903), and later authors.—Similar to var. *aspera* but the panicle very lax, its few distant very prolonged and divergent branches (up to 4.5 dm. long) floriferous chiefly above the middle, their bracteal leaves elliptic to oval; involucre 3.5–5.5 mm. long, the inner bracts often prolonged, linear, obtuse or acute, often membranaceous.—Dry to moist open woods, clearings and thickets, Georgia to Texas,

north to Virginia, southern Indiana and Arkansas. Flowering through September and October. PLATE 430.

SOLIDAGO AURICULATA Shuttleworth ex Blake in Journ. Wash. Acad. Sci. xxi. 326 (1931). *S. amplexicaulis* Torr. & Gray, Fl. N. Am. ii. 218 (1842), not Martens in Bull. Acad. Brux. viii. 67 (1841). *S. auriculata* Shuttleworth ex Gray, Syn. Fl. N. Am. 1². 153 (1884), as synonym. *S. notabilis* Mackenzie in Small, Man. Se. Fl. 1353, 1509 (1933).

Mackenzie, in publishing *Solidago notabilis* in 1933, must have overlooked the proper publication in 1931 by Blake of Shuttleworth's manuscript name *S. auriculata*. The latter, validated by Blake, is correct; the former is a synonym.

THE VARIETIES OF *SOLIDAGO NEMORALIS* (PLATE 431). As I understand the species, *Solidago nemoralis* Ait. has three strongly defined geographic varieties, probably all of which have been treated as species but which show altogether too much intergradation. Typical *S. nemoralis*, the wide-ranging plant (a New Jersey specimen in the Gray Herbarium matched with the type by Asa Gray and Francis Boott), has the basal leaves broadly oblanceolate to spatulate-obovate; and the principal cauline ones decrease gradually in size to the summit, the upper reduced ones being narrowly oblanceolate. The heads are crowded on the branches of the panicle and vary with habitat and exposure from subsessile to more definitely short-pedicelled.

On the Prairies and Plains much of *Solidago nemoralis* has the leaves narrower, the basal narrowly oblanceolate to lance-linear, the upper cauline linear-oblanceolate or linear. This plant of the Plains has the heads (FIGS. 3-5) usually large for the species, though equally large heads (FIGS. 7-9, 11, 12) are often found in the more eastern plant, and the pedicels are often quite evident. This was first described in 1836 as *S. decemflora* DC. Prodr. v. 332 (1836), a sheet of the type number (*Berlandier*, no. 1924) in the Gray Herbarium being (except for greater discoloration) a good match for the type of *S. longipetiolata* Mackenzie & Bush in Trans. Acad. Sci. St. Louis, xii. 87, t. xvi (1902). Much of the latter plant, furthermore, seems to me inseparable from the type-collection of *S. diffusa* Nelson in Bull. Torr. Bot. Cl. xxv. 378 (1898), which, because the name is a later homonym, was altered to *S. pulcherrima* Nelson, l. c. 549 (1898). As far west as Wyoming this extreme of *S. nemoralis* is apparently rare, though it is now known

to reach Montana, Utah and Arizona, for in publishing it Nelson said "It is seemingly quite local as nothing approaching it has been secured in several years' collecting in the state." Nelson also added the illuminating footnote: "Dr. Rydberg suggests that this is the *S. nemoralis* of most of the Western Reports and states that its range extends from Kansas to the Saskatchewan. It is so very different from the eastern *S. nemoralis* that I had not associated the two at all."

The isotype of *Solidago pulcherrima* in the Gray Herbarium has the involucral bracts (FIG. 5) obtuse, the isotype of *S. longipetiolata* has them also obtuse (FIG. 3) but not quite so round-tipped, and the isotype of *S. decemflora* has them (FIG. 4) as in the Mackenzie & Bush type, or slightly acutish. In publishing *S. longipetiolata* Mackenzie & Bush specially emphasized the narrower leaves and the larger heads, which constitute the chief differential characters of the plant of the Plains, but they also said "Distinguished from *S. nemoralis* Ait. by . . . more imbricated involucre, with sharper scales, lower height, more simple inflorescence and much more pubescent achenes." As to the "lower height," they assigned their plant a height of "3-6 dm.", while Nelson had given for his earlier *S. diffusa* "stems 6-8 dm. long." Specimens distributed by Bush as his and Mackenzie's *S. longipetiolata* are 8 dm. high, and large specimens of it from Arkansas are 1.3 m. high. Such a height as the latter for *S. nemoralis* would be unusual and plenty of eastern material from arid and wind-swept habitats is depressed and with stems only 1-2 dm. long. The panicle of the western material is commonly more slender and with less divergent branches than in much of the eastern, but it is altogether too easy to find either form of panicle east or west. As to the "sharper scales" of the plant of the Plains it is significant that Rydberg, not averse to weak species, should have specially separated all the members of the series (*S. nemoralis*, *S. longipetiolata* and *S. pulcherrima*) from the slenderly stoloniferous *S. mollis*, etc. by "Bracts . . . obtuse."¹ Incidentally, although *S. nemoralis* has the bracts most commonly obtuse, the futility of trying to draw too fine a distinction on this character is shown by the occurrence of plenty of broad-leaved *S. nemoralis* on the Atlantic slope with acutish scales (FIGS. 6, 11, 12). In PLATE 431 I am showing involucre from various areas which should make this point clear; they are all of the same magnification (× 5). FIG. 3, as explained, is from an isotype of *S. longipetiolata*,

¹ Rydb. Fl. Prair. Pl. 792 (1932).

FIG. 4 from an isotype of *S. decemflora* and FIG 5 from an isotype of *S. pulcherrima*. Certainly it is not easy to find fundamental differences to separate these involucres from nos. 7 (from Virginia), 8 (from Pennsylvania), 9 (from Maryland) and 10 (from Rhode Island); and, surely, it is difficult to make out, as Mackenzie & Bush, maintained, that the western has "sharper scales." FIG. 3, from the isotype of *S. longipetiolata* shows them obtuse enough; but FIG. 6 is from a specimen from Maine, FIG. 11, from one from New York and FIG. 12 from one from Prince Edward Island. The plants from which these were taken show no other points of difference to separate them from plants of the Atlantic slope which supply FIGS. 7-10. Similarly with the achenes; I find no appreciable difference. I am, therefore, unable to maintain the plant of the Plains as a species. It seems to me rightly called

S. NEMORALIS Ait., var. **decemflora** (DC.), comb. nov. *S. decemflora* DC. Prodr. v. 332 (1836). *S. diffusa* Nelson in Bull. Torr. Bot. Cl. xxv. 378 (1898), not Gray (1861). *S. pulcherrima* Nelson, l. c. 549 (1898). *S. longipetiolata* Mackenzie & Bush in Trans. Acad. Sci. St. Louis, xii. 87, t. xvi. (1902).—Western Ontario to northern Alberta, south to Kentucky, Arkansas, Texas and Arizona.

In his earlier work Asa Gray interpreted *Solidago decemflora* as *S. radula* Nutt. ("Probably what I referred to *S. decemflora*, in *Pl. Lindh.* 2, p. 222, likewise belongs here"—Gray, *Pl. Wright.* i. 95 (1852)); but when he had studied the Berlandier material from Texas, TYPE of *S. decemflora*, he made the correction under his discussion of *S. nemoralis*: "Some of the specimens have narrowly lanceolate leaves, and are *S. decemflora* DC.!"—Gray l. c. 94.

While botanizing on the "East Shore" of Virginia, in October, 1935, Messrs. Long, Fogg and I were much impressed with the woodland plant which, at least in Northampton County, largely replaces the widespread *Solidago nemoralis*. The latter has the leaves gradually decreasing in size up to the inflorescence, the upper ones being narrowly oblanceolate, and the heads are sessile or with only very short pedicels and crowded nearly to the bases of the divergent panicle-branches. The plant of pine woods on the Cape Charles Peninsula has the lower cauline leaves as in typical *S. nemoralis* but about midway on the stem they are abruptly reduced in size and altered in form, continuing to the summit as subuniform spatulate-obovate bracteiform leaves. The inflorescence, too, is comparatively lax, with the heads mostly on obvious pedicels up to three times the



Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. SPHAGNOPHILA: FIG. 1, plant, $\times \frac{2}{5}$, from TYPE-collection; FIG. 2, internode and base of leaf, $\times 5$, from TYPE-collection; FIGS. 3 and 4, involucres, $\times 5$, from TYPE-collection.

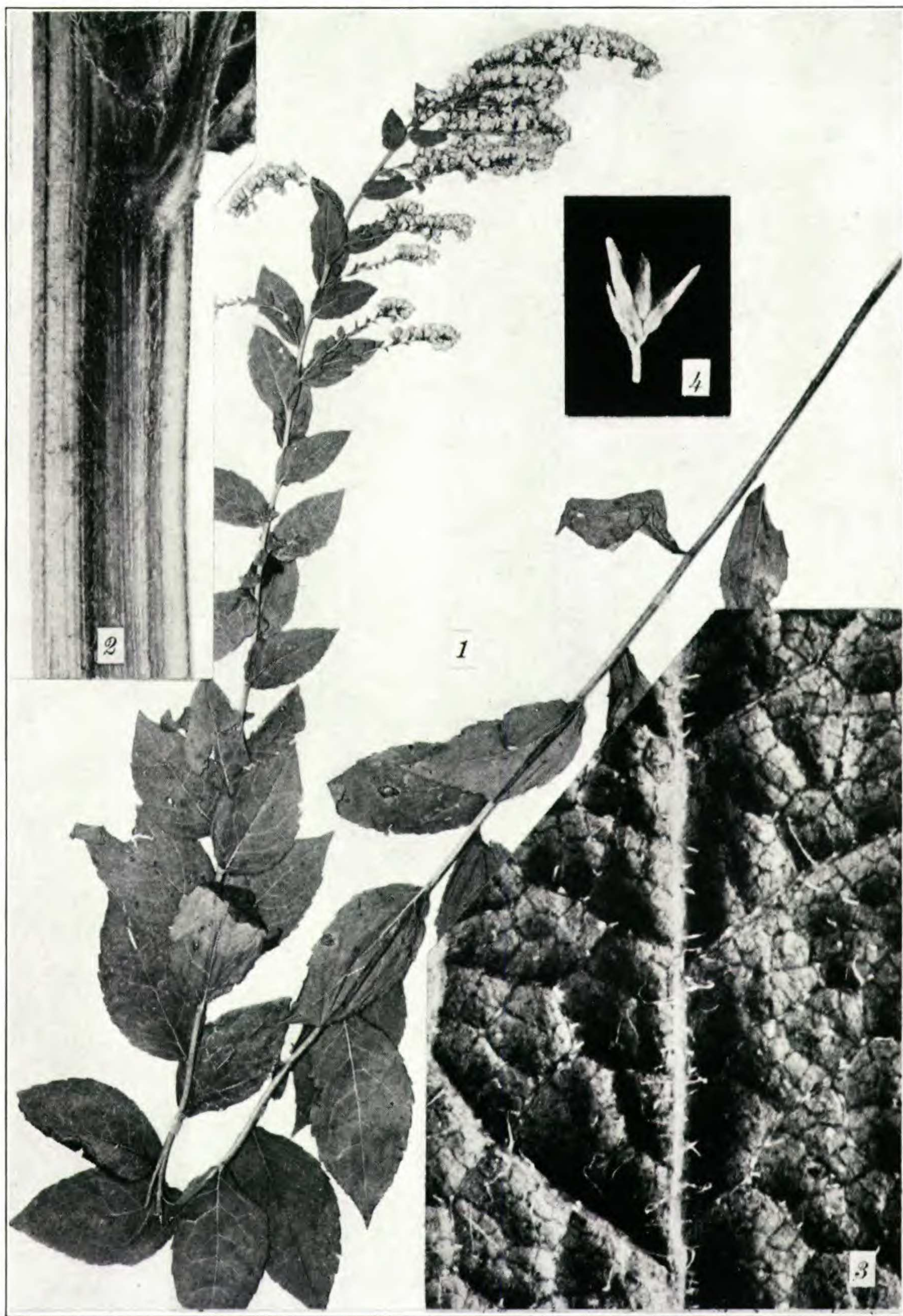


Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. *ASPERA*: FIG. 1, plant, $\times \frac{2}{5}$, from Massachusetts; FIG. 2, internode and leaf-base, $\times 5$, from Connecticut; FIG. 3, lower surface of leaf, $\times 10$, from Connecticut; FIG. 4, involucre, $\times 5$, from same specimen as FIG. 3.

length of the involucre and borne at the tips of the strongly ascending branches. In pubescence, basal and lower cauline leaves, involucre, flowers and achenes the plant is good *S. nemoralis*, its departures being in the reduction and shape of the upper leaves and the looser inflorescence with long ascending leafy branches. Exactly similar plants are in the Gray Herbarium from dry pine-barrens north of Leslie, Georgia (*Harper*, no. 1722), from Louisiana (*Hale*) and from eastern Texas (San Felipe de Austin, *Drummond*, no. 111), while they are strongly approached by material from the cedar glades of Tennessee (*Gattinger*) and from "barrens of Kentucky" (*Short*). The Texas, Louisiana and Kentucky specimens (along with one from Michigan which I should not place with them) constituted *S. nemoralis*, γ . of Torrey & Gray, with "leaves more scabrous; the upper short, obovate-spatulate." Unfortunately, Torrey & Gray assigned no name to this remarkable southern variety and I cannot find that it has been named, unless it is what Elliott meant when he described *S. cinerascens* Schweinitz in Ell. Sk. ii. 375 (1824). The typification of *S. cinerascens* is mixed between Elliott's own material from Georgia actually described and material, undescribed, which he had received from Schweinitz: "The plant I have described agrees in most respects with specimens sent me under this name from Salem, North-Carolina, by Dr. Schweinitz." In view of this confusion, the very indefinite condition of the Elliott plants and his characterization of the leaves as "long, linear-lanceolate," it is unwise to use for our variety the name given by Elliott to some similar plant; his "*leaves* . . . , the upper distant and small" and his "*peduncles* . . . longer than the involucre" sound like it, but it is safer to designate a new type. I am calling the extreme plant of the Southeast

S. NEMORALIS Ait., var. **Haleana**, var. nov. (TAB. 431, FIGS. 1 et 2), foliis caulinis inferioribus oblanceolatis 3–15 cm. longis, superioribus valde reductis spatulatis distantibus 0.5–3 cm. longis; ramibus panicularum ascendentibus apice recurvatis; racemis laxis pedicellis elongatis.—Texas to Georgia, north to Kentucky and eastern Virginia. TYPE: Louisiana, *Dr. Josiah Hale*, included under *S. nemoralis*, γ . Torr. & Gray. Our Virginia material, not so extreme as the type, is from sandy pine woods at and east of Eastville, *Fernald & Long*, nos. 5524, 5525; dry pine woods north of Capeville, *Fernald, Long & Fogg*, no. 5526.

In PLATE 431, FIG. 1 is the type of var. *Haleana*, $\times \frac{2}{5}$, FIG. 2 an involucre, $\times 5$; the other figures show involucre, $\times 5$, as already explained.